#### Memorization or understanding: are we teaching the right thing?



VE

TA

Queen's University Kingston, ON, Canada, 11 November 2011

#### How do we learn?

Think of something you are good at — something that you know you do well.

#### How do we learn?

Think of something you are good at — something that you know you do well.

How did you become good at this?

## How do we learn?

Became good at it by:

- 1. practicing
- 2. lectures
- 3. trial and error
- 4. apprenticeship
- 5. other

## How we teach...



# Learning spaces



# Learning spaces



# Learning spaces





## Some people talk in their sleep.

#### Some people talk in their sleep.

#### Lecturers talk while other people are sleeping.

Albert Camus



#### lectures focus on information transfer...

#### education is not just information transfer



#### education is not just information transfer



#### education is not just information transfer





#### conventional problems misleading



#### conventional problems misleading

**Calculate:** 

(a) current in 2- $\Omega$  resistor

(b) potential difference

between P and Q





#### are the basic principles understood?



#### are the basic principles understood?

- When S is closed, what happens to:
- (a) intensities of A and B?
- (b) intensity of C?
- (c) current through battery?
- (d) potential difference across
  - A, B, and C?
- (e) the total power dissipated?













#### Give students more responsibility for gathering information...

#### Give students more responsibility for gathering information... so we can better help them assimilate it.

Includes Class-Tested, Ready-to-Use Resources

FRIC MALUA

A User's Manual

#### Main features:

- pre-class reading
- in-class: depth, not 'coverage'
- ConcepTests

ConcepTest:

- 1. Question
- 2. Thinking
  - 3. Individual answer
  - 4. Peer discussion
  - 5. Revised/Group answer
  - 6. Explanation



is it any good?

#### first year of implementing PI



#### first year of implementing PI



#### first year of implementing PI





#### what about problem solving?









# So better understanding leads to better problem solving!



So better understanding leads to better problem solving!

(but "good" problem solving doesn't always indicate understanding!)

#### Funding:

#### **National Science Foundation**

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